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# The Proper Use of Proprioceptive Neuromuscular Facilitation

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# Proprioceptive Neuromuscular Facilitation

According to Dr. Phil Page from *The International Journal of Sports Physical Therapy*, "human movement is dependent on the amount of range of motion available in synovial joints" (110). The amount of tension in the surrounding muscles can limit the range of motion in synovial joints (Page 110). In order to release tension and allow full range of motion, many individuals, especially athletes, stretch the muscles that are tight. There are a few main methods of stretching: dynamic stretching, static stretching, and proprioceptive neuromuscular facilitation (PNF). People in many different settings are familiar with dynamic and static stretching, whereas few outside the clinical setting understand PNF stretching. PNF is a specific kind of stretching that "involves a shortening contraction of the opposing muscle to place the target muscle on stretch, followed by an isometric contraction of the target muscle" (Victoria 623). There are two major PNF techniques, both of which are effective due to the specific physiological mechanisms of autogenic and reciprocal inhibition that they utilize. PNF is similar in many ways to the popular method of static stretching, but differs significantly from the popular stretching method called dynamic stretching.

When athletic trainers speak about PNF, they use a specific set of vocabulary to describe what is taking place inside the body. The first set of terms that athletic trainers use are the ones that refer to the stretching method itself: p*roprioceptive, neuromuscular,* and *facilitation.* According to Irvin, the word *proprioceptive* "means receiving stimulation within the tissues of the body" (149). He describes this technique as a *proprioceptive* technique because it utilizes the nerves involved with *proprioception*, which is the "awareness of posture and movement" (570). *Neuromuscular* is the term that athletic trainers use because the technique involves both the nervous system and the muscular system (Irvin 149). And finally, *facilitation* means the "promotion or hastening of a natural process" (Irvin 149). Therefore, proprioceptive neuromuscular facilitation is a process that uses the interaction between the proprioceptive nerves and the muscles that they control in order to hasten the natural healing process. The next set of terms that athletic trainers use are the terms isotonic and isometric. These two terms describe types of muscle contractions. An isometric contraction is a muscle contraction where

the muscle length stays the same throughout the contraction, and an isotonic contraction is a muscle contraction where the muscle length changes through the contraction. Finally, one more set of terms that athletic trainers use are the terms agonist and antagonist. The agonist muscle refers to the muscle that the athletic trainer is stretching. The antagonist muscle refers to the muscle that works counter to the agonist muscle. When the agonist muscle contracts, the antagonist elongates, and when the antagonist contracts, the agonist elongates.

There are two major PNF techniques that athletic trainers use for stretching. The first and most common technique is the contract-relax technique. In this technique, the athletic trainer assisting the patient being stretched will passively place "the restricted muscle into a position of stretch" (Victoria 624). The athletic trainer will then give a verbal command for the patient to push, and the patient will contract the agonist muscle. The contraction can either be an isometric or an isotonic contraction based upon the athletic trainer's goal for the PNF session. If the athletic trainer's goal is to stretch out the tight muscle, then he or she will use an isometric contraction. The patient holds the isometric contraction for a at least three seconds at "20%-50% of [the patient's] maximal effort" (Victoria 624). If the athletic trainer's goal is to rehabilitate an injury, then he or she will use an isotonic contraction. The patient contracts muscle groups through a pattern of movement while the athletic trainer provides resistance to those movements (Surburg and Schrader 36).

The second major PNF technique is the contract-relax-contract technique. This technique is similar to the contract-relax technique, except it takes the stretch one step further. The patient performs an isometric contraction with the agonist muscle against the resistance that the athletic trainer provides. Once the patient releases the contraction, he or she will contract the antagonist muscle against resistance that the athletic trainer provides for the same amount of time and at the same level of effort (Victoria 625).

Both of the major PNF techniques are effective because they utilize a physiological mechanism called autogenic inhibition. Autogenic inhibition is a reflex "that occur[s] when the Golgi Tendon Organs (GTOs) in the tendons of the [target muscle]…detect harmful stimuli" (Briggs 107). The Golgi Tendon Organ (GTO) is a sensory nerve that is embedded into the muscle fibers. When it detects possible injury to the muscle by over-extension, it sends a message to the brain that tells it to tighten up the muscle. However, if "a sustained contraction has been applied to the [GTO] for longer than 6 seconds," then the GTO relaxes and the muscle elongates (Victoria 627). Therefore, the athletic trainer gives the verbal command to contract the agonistic muscle. If the patient is able to contract the agonist muscle against the resistance that the athletic

trainer provides for at least six seconds, then the GTO will give the signal to release and relax, giving the patient the ability to stretch the agonist muscle farther (Briggs 107).

The contract-relax-contract method makes use of another physiological mechanism called reciprocal inhibition. Reciprocal inhibition is based on "the way in which the [agonist] muscle and its antagonist muscles work together" (Briggs 107). In the final contraction of the contract-relax-contract method, the patient will contract his or her antagonist muscle against resistance provided by the athletic trainer. When the antagonist muscle contracts, the agonist muscle elongates to help allow for the contraction of the antagonist muscle (Briggs 107). By adding this additional way of elongating the agonist muscle, the contract-relax-contract PNF technique attempts to increase the chances of the agonist muscle being elongated by utilizing multiple physiological mechanisms.

The common type of stretching that PNF is most similar to is static stretching. Static stretching, according to Dr. Page, is a "traditional…type [of stretching]…where a specific position is held with the muscle on tension to a point of a stretching sensation and repeated" (110). What makes static stretching different than PNF is that static stretching does not involve any muscle contraction to facilitate muscle elongation. They both are similar, however, in the fact that according to a study by Jerome Danoff, "static and PNF stretching…[do] not significantly change power performance" (1532). Both of the methods of stretching engage the muscle in continuous tension "beyond the normal range of motion," which engages the mechanism of autogenic inhibition (Danoff 1532). Danoff theorizes that static and PNF stretching "may produce inhibition that diminishes the number of available motor units, thereby limiting force and power output" (1532). Because static and PNF stretching limit the force and power output, neither stretching technique is effective for increasing the power performance of the muscle (Danoff 1532). However, both PNF stretching and static stretching effectively increase range of motion (Page 112).

Dynamic stretching is another common form of stretching that many are familiar with, however it has many differences with PNF stretching. Instead of holding a muscle contraction for a short period of time, dynamic stretching involves "moving a limb through its full range of motion to the end ranges and repeating several times" (Page 110). Dynamic stretching involves not just one target muscle like PNF and static stretching, but often is a routine that "incorporate[s] continuous and rhythmic movements" which target muscle groups that are specifically related to the particular activity that the individual is about to engage in (Danoff 1528). Danoff found in his study that dynamic stretching increased "power for both slow and fast

movements," particularly when compared to the change in power after static and PNF stretching (1531). As a result, dynamic stretching is a popular technique to engage in pre-exercise, "especially among competitive athletes" because it is more effective at enhancing muscular performance (1531).

Proprioceptive neuromuscular facilitation stretching is a unique form of stretching that uses the body's physiological mechanisms to help increase range of motion. The two major techniques, contract-relax and contract-relax-contract are effective due to their use of the physiological mechanisms of autogenic and reciprocal inhibition. PNF stretching and static stretching are comparatively similar, however dynamic stretching and PNF stretching are considerable dissimilar forms of stretching. Even though it may not be the most well-known method of stretching, PNF can be an effective method of increasing range of motion.

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